CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2003- 0100
CALIFORNIA WATER CODE SECTION 13267

FOR
SPX CORPORATION
MARLEY COOLING TOWER COMPANY STOCKTON FACILITY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY
SAN JOAQUIN COUNTY

This monitoring and reporting program (MRP) incorporates requirements for monitoring of the progress of the groundwater remediation pilot study. This MRP is issued by the Executive Officer of the California Regional Water Quality Control Board, Central Valley Region (Regional Board) pursuant to California Water Code Section 13267. The Marley Cooling Tower Company (MCTC), a wholly owned subsidiary of SPX Corporation (hereafter collectively referred to as Discharger) is required to comply with this MRP. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. Regional Board staff shall approve specific sampling locations prior to implementation of sampling activities. Groundwater Monitoring and Reporting Program No. R5-2003-0030 is still required as specified.

All samples shall be representative of the volume and the nature of the discharge and matrix of the sampled medium. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

PILOT STUDY GROUNDWATER MONITORING

A. LABORATORY ANALYSES

Monitoring of the Phase 1 pilot study will consist of laboratory analysis of groundwater samples collected from MW-206, MW-101, MW-105, MW-104, TW-1, TW-2, TW-3, TW-4, TW-5, and TW-6. Table 1 shows the sampling frequency for Phase 1. Monitoring of Phase 2 pilot study will include laboratory analysis of groundwater samples collected from MW-107, MW-101, MW-104, MW-105, MW-8, MW-208, MW-205, MW-204, TW-7, TW-8, and TW-9. Table 2 shows the sampling frequency for Phase 2. These analyses shall be completed by a California State certified laboratory and shall follow standard EPA protocol.

Constituents	Method[1]	Maximum Detection Limit[2]	Sampling Frequency
Hexavalent Chromium[3]	EPA 7199/7196	2/5µg/l	See attached Tables 1 & 2
Total Chromium	EPA 6020	10µg/l	See attached Tables 1 & 2
Arsenic	EPA 6010	5 µg/l	See attached Tables 1 & 2
Copper	EPA 6010	5 µg/l	See attached Tables 1 & 2
Iron	EPA 6010	5 µg/l	See attached Tables 1 & 2
Bromide	EPA 300.1	1 mg/l	See attached Tables 1 & 2
Nitrate	EPA 300.1	1 mg/l	See attached Tables 1 & 2
Sulfate	EPA 300.1	1 mg/l	See attached Tables 1 & 2
Total Dissolved Solids	EPA 160.1	--	See attached Tables 1 & 2

1 If necessary, equivalent analytical methods may be used. The Discharger shall provide written justification.

2 For non-detectable results

3 For wells with high concentrations, EPA Method 7196 with a 5 µg/l detection limit may be used

B. FIELD MEASURED PARAMETERS

Monitoring of the pilot study will include field measurement parameters of groundwater samples collected from MW-206, MW-101, MW-105, MW-104, TW-1, TW-2, TW-3, TW-4, TW-5, and TW-6 for Phase 1 and groundwater samples collected from MW-107, MW-101, MW-104, MW-105, MW-8, MW-208, MW-205, MW-204, TW-7, TW-8, and TW-9 for Phase 2.

Field testing instruments (such as those used to test Oxidation Reduction Potential (ORP), pH, and dissolved oxygen) may be used provided that:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are calibrated prior to each monitoring event;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are provided with the appropriate monitoring report.

Constituents	Units	Type of Sample	Sampling Frequency
Ground Water Elevation	Feet, Mean Sea Level (MSL)	Grab	Each time well is sampled
Oxygen Reduction Potential (ORP)	Millivolt	Grab, In-situ	See attached Tables 1 & 2
pH	pH units	Grab	See attached Tables 1 & 2
Dissolved Oxygen	mg/l	Grab, In-situ	See attached Tables 1 & 2

REPORTING

In reporting monitoring data, the Discharger shall arrange the data in tabular form so that the date, sample type (e.g., influent, effluent, groundwater, etc.), and reported analytical result for each sample are readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with waste discharge requirements and spatial or temporal trends, as applicable. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall also be reported to the Regional Board.

As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all Reports shall be prepared under the direct supervision of a Registered Engineer or Geologist and signed by the registered professional.

A. Monitoring Reports

Phase 1 Pilot Study
40 Day Report

Within **40 days** after start of injection of Phase 1 pilot study, the Discharger shall submit a report summarizing the results of the pilot test, including an assessment of calcium polysulfide/ethanol injection, and recommendations for continuing with the proposed Phase 2 pilot study.

At a minimum, the report shall include:

1. A narrative description of all preparatory, monitoring, sampling, and analytical testing activities for the groundwater monitoring. The narrative shall be sufficiently detailed to verify compliance with the WDR, the attached MRP, and the Standard Provisions and Reporting Requirements. The narrative shall be supported by documenting flow rates, and total volume of calcium polysulfide and ethanol injected, and parameters measured.
2. An assessment of calcium polysulfide and ethanol discharge to the aquifer, and results of all sampling;
3. Copies of all laboratory analytical report(s);
4. A calibration log verifying weekly calibration of any field monitoring instruments (e.g., pH, dissolved oxygen meter, etc) used to obtain data;
5. An evaluation of the changes in aquifer geochemistry including the extent of hexavalent chromium reduction, assessment of changes in mobility of other metals including arsenic, and changes in sulfate.
6. An analysis of whether the injected calcium polysulfide/ethanol and any breakdown or byproducts is being captured by the extraction system or is continuing to spread;

7. Construction and proposed location details for the Phase 2 injection and temporary monitoring wells;

8. Cumulative data tables containing the water quality analytical results.

B. Quarterly Reports

Quarterly reports shall be submitted to the Board by the **1st day of the second month following the end of each calendar quarter (i.e., by 1 February, 1 May, 1 August, and 1 November**) to assess long-term effects of injected substances on aquifer geochemistry until such time as the Executive Officer determines that the reports are no longer necessary. Each quarterly report shall include the following minimum information:

1. a description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and groundwater elevations in the wells, how and when samples were collected;

2. field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, etc.;

3. groundwater contour maps for all groundwater zones, if applicable;

4. a table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;

6. a copy of the laboratory analytical data report;

7. if applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions.

C. Annual Report

An Annual Report shall be submitted to the Board by **1 February** of each year. This report shall contain an evaluation of the long-term effects on the aquifer of the injected material, effectiveness and progress of the investigation and remediation, and may be submitted with the fourth quarter monitoring report. The Annual Report shall contain the following minimum information:

1. both tabular and graphical summaries of all data obtained during the year;

2. groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;

3. a discussion of long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;

4. an analysis of whether the injected plume, and any breakdown or byproducts is being captured by an extraction system or is continuing to spread;

5. the anticipated date for completion of the pilot study;

6. an identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program and the anticipated date for an effectiveness evaluation of the pilot study;

7. if applicable, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

A letter transmitting the self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

The results of any monitoring done more frequently than required at the locations specified in the MRP also shall be reported to the Board. The Discharger shall implement the above monitoring program as of the date of the Order.

Ordered by: _____
THOMAS R PINKOS, Executive Officer

_____
(Date)

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2003-0100
WASTE DISCHARGE REQUIREMENTS

FOR
SPX CORPORATION
MARLEY COOLING TOWER COMPANY STOCKTON FACILITY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY
SAN JOAQUIN COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Board) finds that:

1. The Marley Cooling Tower Company (MCTC), a wholly owned subsidiary of SPX Corporation (hereafter collectively referred to as Discharger) submitted a Report of Waste Discharge (RWD), dated 8 November 2001, for a pilot study to evaluate the potential for in-situ treatment of groundwater containing chromium. The Discharger also submitted a (a) *Supplemental Pilot Study Work Plan for In Situ Chromium Reduction at The Marley Cooling Tower Facility* dated 21 January 2003 that proposed changes to the RWD, and (b) additional supporting information dated 1 and 16 April, and 1 May 2003.

2. The Discharger owns and previously operated a cooling tower fabrication plant at 150 N. Sinclair Avenue in the East Stockton Area in San Joaquin County (site). As part of the fabrication operations, the Discharger operated a wood preservation process utilizing solutions containing copper, chromium and arsenic. Wood preserving was discontinued at the site in January 1991, however past operational practices left waste constituents in soils and groundwater underlying the site. Soils contain copper, chromium, and arsenic; groundwater contains elevated concentrations of chromium.

3. The project site is shown on Attachment A, a part of this Order. The site is in Section 32, T2N, R7E, MDB&M. The project site plan is shown on Attachment B, a part of this Order.

4. The objective of the pilot study is to evaluate the (a) efficacy of in-situ hexavalent chromium reduction using calcium polysulfide and ethanol injection, (b) assess the secondary impacts of in-situ chemical reduction on groundwater quality, (c) identify design and operational factors that influence the successful performance of the in-situ chemical reduction approach, and (d) generate performance, design and cost data that can be used for design of a full-scale in-situ treatment system as a possible alternative to the current groundwater extraction and treatment system.

5. A sequence of alluvial sediments underlying the MCTC facility from the water table [(approximately 60 ft below ground surface (bgs)] to depths of at least 450 bgs comprises one aquifer. This aquifer is characterized by discontinuous lenses of sand, gravelly sand, clayey silt, silty clay, and clay. The aquifer can be divided into four hydrostratigraphic subunits: a) the shallow zone (water table to 80 ft bgs), b) the 100 ft zone (approximately 80 to 120 ft bgs), c) the intermediate zone (approximately 120 feet to depths ranging from 170 to 200 bgs) and, d) the deep zone extending from below 200 ft bgs to approximately 450 ft bgs. Groundwater generally flows in a southern direction in all zones. Groundwater velocity ranges from about 0.5 to 2.3 feet per day depending on the different zones.

6. The soil and groundwater remediation activities to date at the site have included (a) excavation and off-site disposal of soils containing arsenic exceeding the recommended action levels from ditches and commercial and residential properties, (b) replacement of the synthetic liner in the bottom of the retort pit with an upgraded liner, (c) installation and operation of a retort fluid capture system and a leak detection system, (d) installation and operation of a 500 gallon per minute groundwater extraction and treatment system since 1992 (interim system started in 1987), and (e) installation and operation of a soil flushing system since 1997.

7. Groundwater is currently extracted from 14 extraction wells on and off-site. The groundwater extraction system operates with an extensive network pumping at rates varying from 10-90 gallons per minute depending on effective capture of the groundwater contamination plume. The groundwater treatment system consists of a treatment plant with an electrochemical unit operating in parallel to an ion exchange unit that removes waste constituents from the extracted water. Treated water unto 0.94 million gallons per day (mgd) is discharged to the Stockton Diverting Canal, a tributary to the Calaveras River, under an National Pollution Discharge Elimination System (NPDES) Permit No. CA0081787, Waste Discharge Requirements (WDR) No. R5-2003-0030, and Groundwater Monitoring and Reporting Program (MRP) No. R5-2003-0030.

8. Groundwater monitoring results from January 2002 show that the total chromium concentrations are highest in well MW-105 at a concentration of 18,900 micrograms/liter (µg/l). The groundwater cleanup level for total chromium for the MCTC site is in the "Final Remedial Action Plan Approval Record" dated June 1990, and is the current or any update of the current MCL. The current MCL for total chromium is 50 µg/l.

Pilot Study Layout and Operation

9. The Discharger proposes to inject a chemical reducing agent (calcium polysulfide) and an organic carbon source (ethanol) into shallow groundwater to reduce hexavalent chromium to trivalent chromium, thereby precipitating and immobilizing chromium. The ethanol will serve as a carbon source to stimulate microbial growth, and maintain reducing conditions. The pilot study will be conducted in two phases, Phase 1 and Phase 2.

10. The background groundwater quality (key parameters) for the site, as obtained from March 2003 upgradient monitoring well sampling, is summarized as follows:

Constituent	**Units**	**Concentration Range**	**Water Quality Limit**	**Reference**
Chromium (total)	µg/l	3 to 9	50	California Primary Maximum Contaminant Level (MCL)
Arsenic	µg/l	2 to 5	10	USEPA Primary MCL
Copper	µg/l	2 to 4	170	California Public Health Goal in Drinking Water – Office of Environmental Health and

Constituent	Units	Concentration Range	Water Quality Limit	Reference
				Human Assessment
Iron	µg/l	33 to 132	300	California Secondary MCL
Manganese	µg/l	Non-detect to 20	50	California Secondary MCL
Total Dissolved Solids	mg/l	185-450	500	California Secondary MCL
Nitrate (as nitrogen)	mg/l	12 to 41	10	California Primary MCL
Sulfate	mg/l	13 to 26	250	California Secondary MCL

The Discharger intends to (a) conduct sampling of other monitoring wells, including MW-204, MW-205, and MW-208, to obtain additional information on site background, and (b) submit the collected information for Regional Board staff review for consideration as background ranges.

11. The purpose of the Phase 1 pilot study is to demonstrate that injecting calcium polysulfide into groundwater will effectively reduce hexavalent chromium to trivalent chromium, and to assess the radius of influence of a single injection of calcium polysulfide/ethanol. The purpose of the Phase 2 pilot study is to demonstrate the effectiveness of the direct multiple-injection remediation approach and the persistence of reducing conditions in the shallow groundwater plume zone.

12. During the Phase 1 pilot study, the Discharger proposes to inject up to 5,000 gallons of 3 percent calcium polysulfide solution and 50 gallons of ethanol into boring INJ-1 from 60 to 80 bgs over a period of two days. In addition to the calcium polysulfide and ethanol, sodium bromide, a non-toxic, inorganic tracer will be included in the solution at a concentration of 200 milligrams/liter (mg/l). The tracer will be used to demonstrate that the observed reduction in hexavalent chromium concentrations is due to chemical reduction rather than dilution by the injected solution. Temporary wells including an injection point and six monitoring wells will be installed to supplement the existing monitoring well network. Attachment B, a part of this Order, illustrates the location of the injection point and monitoring wells.

13. The Discharger submitted chemical analyses of the calcium polysulfide mixture and ethanol solution. Metals and minerals were not present at detectable levels in either the calcium polysulfide mixture or the ethanol solution.

14. During Phase 1, groundwater will be monitored for hexavalent chromium (Cr VI), total Cr, bromide (Br), copper (Cu), arsenic (As), iron (Fe), manganese (Mn), sulfate (SO_4), nitrate (NO_3), total dissolved solids (TDS), chloride (Cl), phospate (P), calcium (Ca), potassium (K), hardness, and alkalinity by laboratory analysis. The oxidation/reduction potential (ORP) will be measured in the field along with dissolved oxygen (DO), electrical conductance (EC), temperature, and pH. Monitoring will begin prior to the calcium polysulfide/ethanol injection, and will continue at periodic intervals after injection until it is no longer deemed necessary. Phase 1 will be deemed complete when monitoring shows that the chemical reaction of hexavalent chromium with the injected solution is complete as demonstrated by stabilized hexavalent chromium levels, and the radius of influence of the injected solution is determined. Monitoring will continue to assess long-term potential geochemistry changes.

15. During the Phase 2 pilot study, the Discharger proposes to install up to 75 direct injection points into one to four treatment zones based on the results obtained from the Phase 1 study. The injection points are intended to encompass the width of the shallow chromium groundwater plume upgradient of the highest hexavalent chromium concentration areas. The application area, treatment zones, and injection grid are illustrated in Attachment C, a part of this Order. At each injection point, approximately 5,000 gallons of 3 percent calcium polysulfide solution with 50 gallons of ethanol and 200 milligrams per liter (mg/l) NaBr solution will be injected; injection volumes may be modified based on the results of the Phase 1 pilot test. The monitoring program will utilize the existing monitoring well network. Three temporary wells will be installed to supplement the existing monitoring well network.

16. Groundwater will be monitored for the same suite of constituents as in Phase 1 pilot study (Cr VI, Br, Cu, As, Fe, Mn, SO_4, NO_3, TDS, Cl, P, Ca, K, hardness, and alkalinity) by laboratory analysis; ORP, DO, EC, temperature, and pH in the field). Monitoring will begin prior to calcium polysulfide/ethanol injection, and will continue at periodic intervals until it is no longer deemed necessary.

17. The injection of calcium polysulfide, ethanol and sodium bromide into the groundwater is a discharge of waste as defined by the California Water Code.

18. Based on the Discharger's experience at similar sites, short-term increases in sulfate and TDS concentrations may occur as calcium polysulfide is oxidized. Sulfate and TDS concentrations are expected to decrease to pre-injection concentrations over time.

19. The Discharger has proposed a contingency plan that includes pumping of groundwater using the existing extraction and treatment system. The Discharger will maintain hydraulic capture of the pilot study treatment zone using the existing extraction system.

20. Phase 2 will be considered complete when sufficient data are obtained to demonstrate (a) effective delivery of the injected solutions, (b) effective reduction of hexavalent chromium, and (c) establishment of reducing conditions in the treatment zone. Monitoring will continue to assess long-term geochemistry changes. The effectiveness of the in situ remediation may be evaluated before trends in all monitored constituents stabilize.

21. The pilot study will conclude when the injected concentrations of metals (hexavalent chromium, total chromium, arsenic, copper, iron, manganese, and other parameters (sulfate, calcium, nitrate, and total dissolved solids) stabilize.

Basin Plan, Beneficial Uses, and Regulatory Considerations

22. *The Water Quality Control Plan, Sacramento River and San Joaquin River Basins, fourth edition*, (Basin Plan) designates beneficial uses, establishes Water Quality Objectives (WQOs), contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (State Board). These requirements implement the Basin Plan.

23. The Basin Plan designates the beneficial uses of the underlying groundwater as municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply.

24. State Board Resolution No. 68-16 (hereafter Resolution 68-16 or the "Anti-degradation Policy") requires the Board, in regulating the discharge of waste, to maintain high quality waters of the state until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the Board's policies (e.g., quality that exceeds water quality objectives).

25. Temporal, short-term degradation of the groundwater by calcium polysulfide/ethanol injection may occur in a limited portion of the aquifer near the injection points. Such degradation is consistent with Resolution 68-16 since (a) the purpose of the discharge is to implement the cleanup of groundwater pollution and such remediation will benefit the people of the State; (b) the discharge as allowed in this Order is a pilot project to evaluate the effectiveness and is limited in scope and duration; (c) this Order requires use of best practicable treatment, including adequate monitoring and contingency plans to assure protection of water quality; and (d) this Order does not allow discharges of waste to exceed water quality objectives other than those temporarily permitted by these WDRs. Calculations provided by the Discharger show that WQOs for hydrogen sulfide, sulfate, and TDS maybe temporarily exceeded using the worst-case scenario assumptions, although WQO exceedence is not anticipated.

26. Section 13267(b) of California Water Code provides that: "In conducting an investigation specified in subdivision (a), the Regional Board may require that any person who has discharged, discharges, or is suspected of discharging, or who proposes to discharge within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of discharging, or who proposes to discharge waste outside of its region that could affect the quality of the waters of the state within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the board requires. The burden, including costs of these reports, shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring those reports, the Regional Board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports." The technical reports required by this Order and the attached Monitoring and Reporting Program No. R5-2003-0100 are necessary to assure compliance with these waste discharge requirements.

27. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981). These standards, and any more stringent standards adopted by the Discharger or county pursuant to CWC Section 13801, apply to all extraction and monitoring wells.

28. Issuance of this Order is an action to assure the restoration of the environment and is, therefore, exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21000, et seq.), in accordance with Section 15308 and 15330, Title 14, California Code of Regulations (CCR).

29. This discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq., (hereafter Title 27). The exemption pursuant to Section 20090(b), is based on the following:

    a. The Board is issuing waste discharge requirements,

b. The requirements implement the Basin Plan, and
c. The wastewater does not need to be managed according to Title 22 CCR, Division 4.5, and Chapter 11, as a hazardous waste.

30. Pursuant to California Water Code Section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

Public Notice

31. The Regional Board considered all the above and the supplemental information and details in the attached Information Sheet, which is incorporated by reference herein, in establishing the following conditions of discharge.

32. The Regional Board has notified the Discharger and interested persons of its intent to prescribe waste discharge requirements for this discharge, and has provided them with an opportunity to submit their written views and comments.

33. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, pursuant to Sections 13267 and 13263 of the California Water Code, SPX Corporation, Marley Cooling Tower Company, its agents, successors and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted there under, shall comply with the following while conducting the above-described pilot study:

[Note: Other prohibitions, conditions, definitions, and some methods of determining compliance are contained in the attached "Standard Provisions and Reporting Requirements for Waste Discharge Requirements" dated 1 March 1991, incorporated herein.]

A. Discharge Prohibitions:

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. Discharge of waste classified as 'hazardous' under Section 2521, Chapter 15 of Title 23 or 'designated', as defined in Section 13173 of California Water Code is prohibited.

3. The discharge of waste at any location or in a manner different from that described in Findings Numbers 12 and 15 is prohibited.

B. Discharge Specifications

1. The Discharger shall not cause the permeability of the aquifer, either inside or outside of the calcium polysulfide/ethanol treatment area, to be affected to such a degree that the Discharger is unable to effectively operate extraction wells for the purpose of containing the calcium polysulfide, and ethanol or its byproducts.

2. The discharge shall not cause the high quality groundwater unaffected by the current plume undergoing cleanup to be degraded by the constituents identified herein.

C. Groundwater Limitations:

1. The Discharger shall not cause the groundwater to contain taste and odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

2. The Discharger shall not cause groundwater to contain waste constituents greater than background ranges listed in Finding No. 10, except for calcium, sulfate, and TDS.

3. The Discharger shall not cause an increase in any groundwater constituent above background ranges listed in Finding No. 10 in the following downgradient wells for each treatment zone: Zone 1 – MW-208; Zone 2 – MW-208 and MW-205; Zone 3 – MW-204; and Zone 4 – MW-204. Localized short-term exceedance of WQOs for sulfate and TDS may occur in close proximity to the treatment zone. Over time, the sulfate and TDS concentrations are expected to decrease to near background.

4. At the conclusion of the pilot study, the Discharger shall not cause the groundwater to contain concentrations of chemical constituents, including the injected substance, and any breakdown products or by-products of the in-situ treatment process, in amounts that adversely affect beneficial uses.

D. Provisions:

1. The Discharger shall notify the Regional Board a minimum of two weeks prior to the start of Phase 1 injection of calcium polysulfide/ethanol.

2. The Discharger shall submit the results and recommendations from the Phase 1 injection for Regional Board staff review and concurrence prior to start of any field activities for the Phase 2 injection.

3. The Discharger shall provide an alternate water supply source for any municipal, domestic or other water use, if affected by the Discharger's wastes.

4. All of the following reports shall be submitted pursuant to Section 13267 of the California Water Code. In accordance with California Business and Professions Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain work plans for, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), even if not explicitly stated. Each technical report submitted by the Discharger shall contain a statement of qualifications of the responsible licensed professional(s) as well as the professional's signature and/or stamp of the seal.
   a. Within **40 days** after start of injection of Phase 1 pilot study, the Discharger shall submit a report summarizing the results of the pilot test, including an assessment of calcium

polysulfide/ethanol injection, and recommendations for continuing with the proposed Phase 2 pilot study. At a minimum, the report shall include:

(1). A narrative description of all preparatory, monitoring, sampling, and analytical testing activities for the groundwater monitoring. The narrative shall be sufficiently detailed to verify compliance with the WDR, the attached MRP, and the Standard Provisions and Reporting Requirements. The narrative shall be supported by documenting flow rates, and total volume of calcium polysulfide and ethanol injected, and parameters measured.

(2). An assessment of calcium polysulfide and ethanol discharge to the aquifer, and results of all sampling;

(3). Copies of all laboratory analytical report(s);

(4). A calibration log verifying weekly calibration of any field monitoring instruments (e.g., pH, dissolved oxygen meter, etc) used to obtain data;

(5). An evaluation of the changes in aquifer geochemistry including the extent of hexavalent chromium reduction, assessment of changes in mobility of other metals including arsenic, and changes in sulfate.

(6). An analysis of whether the injected calcium polysulfide/ethanol and any breakdown or byproducts is being captured by the extraction system or is continuing to spread;

(7). Construction and proposed location details for the Phase 2 injection and temporary monitoring wells;

(8). Cumulative data tables containing the water quality analytical results.

5. The Discharger shall comply with the attached MRP No. R5-2003-0100, which is part of this Order, and any revisions thereto as ordered by the Executive Officer. Modifications to MRP No. R5-2003-0100 may be made to continue process monitoring if any parameter does not return to pre-injection conditions.

6. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements," dated 1 March 1991, which are by reference, a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."

7. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Board or court order requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.

8. Should the evaluation of the pilot test data reveal adverse effects on groundwater quality due to calcium polysulfide/ethanol injection, the Discharger shall notify the Regional Board within 24 hours, followed by a written summary within two weeks. The Discharger shall clean up

and abate these effects, including extraction of any byproducts. The Discharger shall provide a status summary report within two months detailing activities to implement the contingency plan.

9. Prior to any modifications at the site that would result in material change in the quality or quantity of the calcium polysulfide or ethanol, or any material change in the character, location, or volume of the discharge, the Discharger shall report all pertinent information in a Report of Waste Discharge to the Regional Board for review. This Order may be revised prior to implementation of any modifications.

10. The Discharger shall maintain records of all monitoring information including all calibration and maintenance records, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, or report. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer.

11. While this Order is in effect, and prior to any change in ownership of the Site or management of this operation, the Discharger shall transmit a copy of this Order to the succeeding Owner/Operator, and forward a copy of the transmittal letter and proof of transmittal to the Board.

12. The Discharger shall allow the Regional Board, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:
    a. Enter upon the premises regulated by the Regional Board, or the place where records must be kept under the conditions of this Order;
    b. Have access to and copy, at reasonable times, any records that shall be kept under the conditions of this Order;
    c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and
    d. Sample or monitor, at reasonable times, for the purpose of assuring compliance with this Order or as otherwise authorized by the California Water Code, any substances or parameters at this Site.

13. A copy of this Order shall be kept at the discharge facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.

14. The Regional Board will review this Order periodically and will revise requirements when necessary.

I, THOMAS R. PINKOS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 6 June 2003.

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THOMAS R. PINKOS, Executive Officer

INFORMATION SHEET

WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2003-0100
SPX CORPORATION, MARLEY COOLING TOWER COMPANY
IN SITU GROUNDWATER REMEDIATION PILOT STUDY
SAN JOAQUIN COUNTY

The Marley Cooling Tower Company (MCTC), a wholly owned subsidiary of SPX Corporation (hereafter Discharger) owns and operates a groundwater extraction and treatment system in the East Stockton Area of San Joaquin County. The Discharger previously operated a cooling tower fabrication plant at the site which included a wood preservation process using solutions containing copper, chromium and arsenic. Wood preserving was discontinued at this facility in January 1991, however past operational practices have resulted in contamination of soils and groundwater underlying the site. Soils have been contaminated with copper, chromium, and arsenic; groundwater has been polluted primarily by chromium at concentrations up to 18,900 micrograms/liter (µg/l). The plume of polluted in groundwater extends approximately 2,500 feet south of the MCTC facility.

Groundwater is currently extracted from 14 extraction wells on and off-site. The groundwater extraction system operates with extraction wells pumping at rates varying from 10-90 gallons per minute depending on effective capture of the groundwater contamination plume. The groundwater treatment system consists of a treatment plant with an electrochemical unit operating in parallel to an ion exchange unit that removes waste constituents from the extracted water. The Discharger is permitted to discharge up to a maximum of 0.94 million gallons per day (mgd) of treated groundwater and storm water runoff under National Pollution Discharge Elimination System (NPDES) Permit CA0081787, Order No. R5-2003-0030, to the Stockton Diverting Canal, a water of the United States and a tributary to the Calaveras River.

The Discharger is evaluating alternatives to accelerate the cleanup of the polluted groundwater, including in-situ chemical reduction of chromium. The Discharger submitted a Report of Waste Discharge (RWD), dated 8 November 2001, for a pilot study to evaluate the potential for in-situ treatment of groundwater containing chromium. The Discharger also submitted a (a) *Supplemental Pilot Study Work Plan for In Situ Chromium Reduction at The Marley Cooling Tower Facility*, dated 21 January 2003 that proposed changes to the RWD dated 8 November 2001. Additional supporting information was submitted by the Discharger on 1 and 16 April, and 1 May 2003.

The pilot study will target groundwater in the uppermost water-bearing zone. The objective of the in-situ groundwater pilot study is to evaluate the (a) ability of in-situ hexavalent chromium reduction using calcium polysulfide and ethanol injection, (b) assess the secondary impacts of in-situ chemical reduction on groundwater quality, (c) identify design and operational factors that influence the successful performance of the in-situ chemical reduction approach, and (c) generate performance, design and cost data that can be used for evaluation as a possible alternative to the current groundwater extraction and treatment system.

The Discharger proposes to inject a chemical reducing agent (calcium polysulfide) and an organic carbon source (ethanol). The calcium polysulfide is intended to quickly alter the oxidation/reduction state of the groundwater and reduce hexavalent chromium to trivalent

chromium in the aquifer and to precipitate it out of solution, thereby immobilizing chromium. The ethanol is proposed as a carbon source to stimulate microbial growth and maintain reducing conditions to precipitate chromium out of solution. The pilot study will be conducted in two phases.

The purpose of the Phase 1 pilot study is to demonstrate that injecting calcium polysulfide into groundwater will effectively reduce hexavalent chromium to trivalent chromium, and to assess the radius of influence of a single injection of calcium polysulfide. The purpose of the Phase 2 pilot study is to demonstrate the effectiveness of the multiple-injection remediation approach and the persistence of reducing conditions in the shallow groundwater plume zone.

During the Phase 1 pilot study, the Discharger proposes to inject up to 5,000 gallons of 3 percent calcium polysulfide solution and 50 gallons of ethanol into injection boring INJ-1 from 60 to 80 bgs over a period of two days. In addition to the calcium polysulfide and ethanol, sodium bromide (NaBr), a non-toxic, inorganic tracer will be included in the solution at a concentration of 200 milligrams/liter (mg/l). This tracer will help to demonstrate that the observed reductions in hexavalent chromium concentrations are due to chemical reduction rather than dilution by the injected solution. Temporary wells including an injection point and six monitoring wells will be installed to supplement the existing monitoring well network.

Groundwater will be monitored for hexavalent chromium (Cr VI), total Cr, bromide (Br), copper (Cu), arsenic (As), iron (Fe), manganese (Mn), sulfate (SO_4), nitrate (NO_3), Total Dissolved Solids (TDS) and general minerals by laboratory analysis. The oxidation/reduction potential (ORP) will be measured in the field along with dissolved oxygen (DO), electrical conductance (EC), temperature, and pH. Monitoring will begin prior to the calcium polysulfide/ethanol injection, and will continue at periodic intervals until it is no longer deemed necessary.

During the Phase 2 pilot study, the Discharger proposes to install up to 75 direct injection points into 1 to 4 different treatment zones based on the results obtained from Phase 1 study. The injection points are intended to encompass the width of the shallow chromium groundwater plume upgradient of the highest hexavalent chromium concentration areas. At each injection point, approximately 5,000 gallons of 3 percent calcium polysulfide solution with 50 gallons of ethanol and 200 milligrams per liter (mg/l) NaBr solution will be injected; injection volumes may be modified based on the results of the Phase 1 pilot test. The monitoring program will utilize the existing monitoring well network. Three temporary wells will be installed to supplement the existing monitoring well network. Groundwater will be monitored for the same suite of constituents as in Phase 1 pilot study.

The *Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition* (Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin. The beneficial uses the groundwater at the site are municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply.

The antidegradation directives of Section 13000 of the California Water Code require that waters of the State that are better in quality than established water quality objectives be maintained "consistent with the maximum benefit to the people of the State." Policies and procedures for complying with this directive are set forth in the Basin Plan (including by reference State Water Board Resolution No. 68-16, "Statement of Policy With Respect to Maintaining High Quality Waters in California," or "Antidegradation" Policy).

State Board Resolution No. 68-16 (hereafter Resolution 68-16 or the "Anti-degradation Policy") requires the Board, in regulating the discharge of waste, to maintain high quality waters of the state until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the Board's policies (e.g., quality that exceeds water quality objectives).

Temporal, short-term degradation of the groundwater by calcium polysulfide/ethanol injection may occur in a limited portion of the aquifer near the injection points. Such degradation is consistent with Resolution 68-16 since (a) the purpose of the discharge is to implement the cleanup of groundwater pollution and such remediation will benefit the people of the State; (b) the discharge as allowed in this Order is a pilot project to evaluate the effectiveness and is limited in scope and duration; (c) this Order requires use of best practicable treatment, including adequate monitoring and contingency plans to assure protection of water quality; and (d) this Order does not allow discharges of waste to exceed water quality objectives other than those temporarily permitted by these WDRs.

The discharger has proposed a contingency plan to remove injected waste constituents and byproducts using the existing groundwater extraction system in the event groundwater degradation occurs as a result of the discharge.

The proposed Order prohibits the discharge of wastes in any manner other than that described in the Findings of the Order, including prohibiting discharge of waste to surface waters or discharge of hazardous waste. The Order requires monitoring and reporting on the progress of the pilot study. The Discharger must obtain Board staff concurrence prior to initiating field activities for Phase 2.

Scale 1 inch = 2,000 ft

ATTACHMENT A

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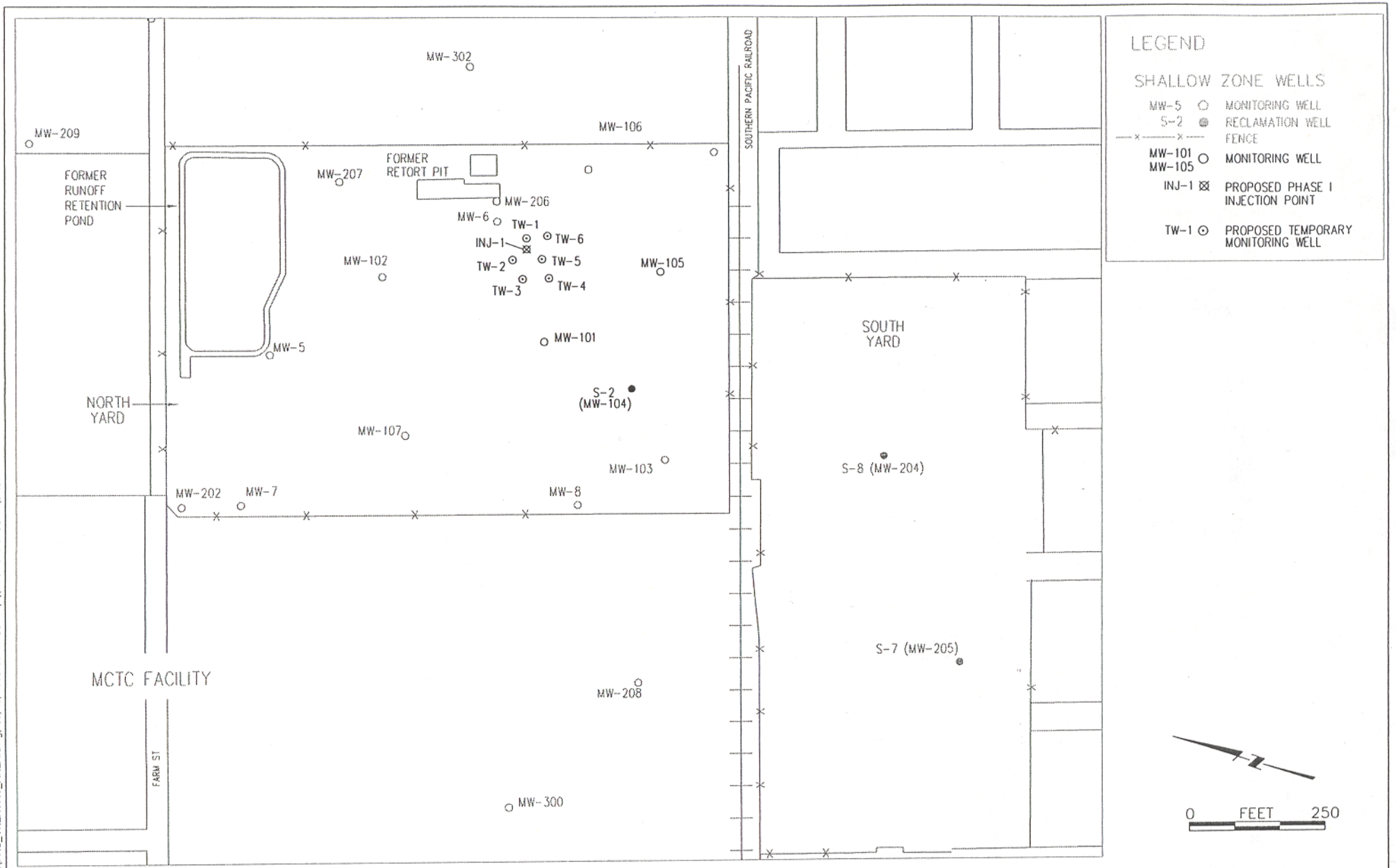
SITE LOCATION MAP

Marley Cooling Tower Company
Stockton, California



Attachment B

SOURCE: DUDEK & ASSOCIATES, INC.

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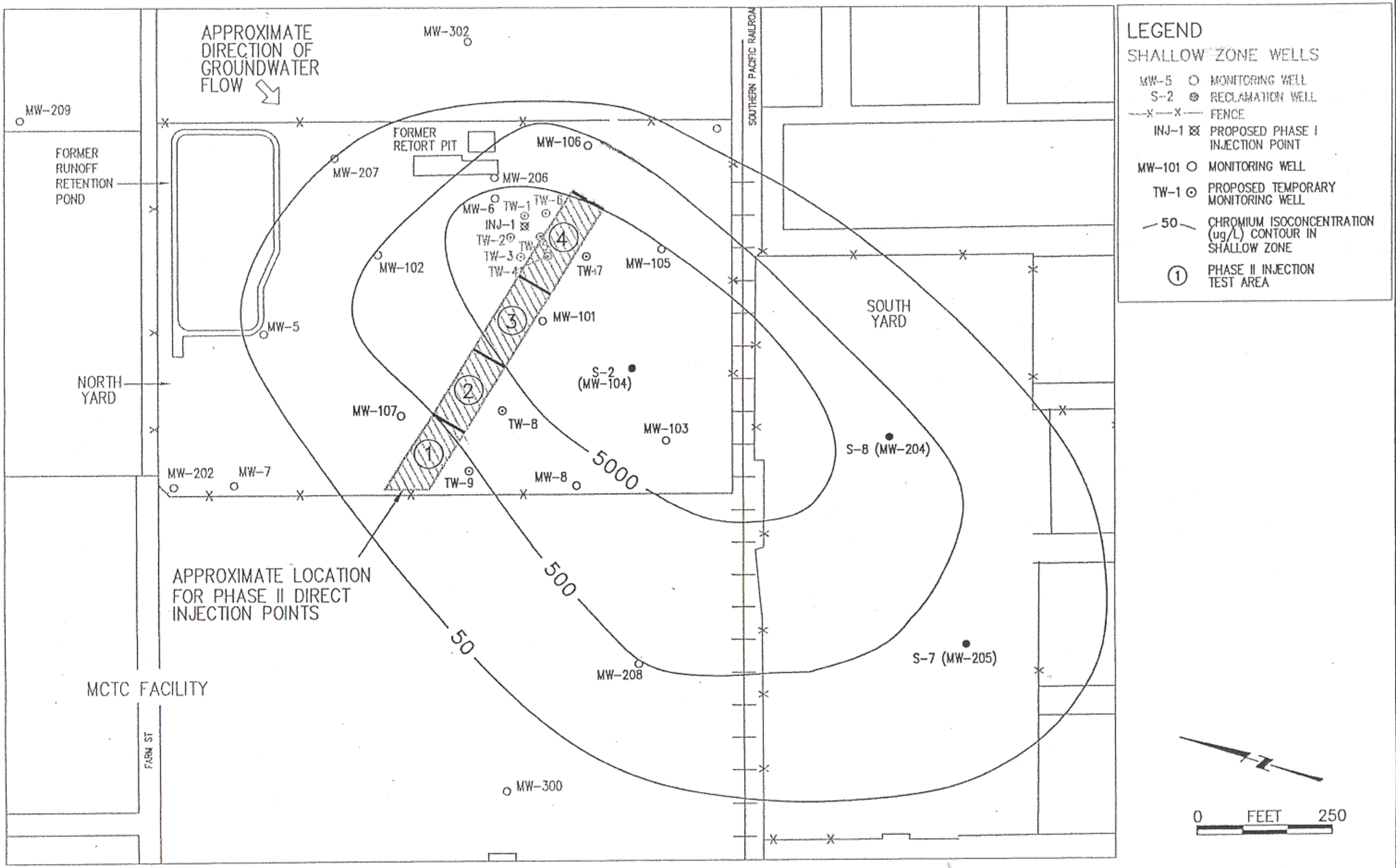
PHASE I TREATMENT AREA

MARLEY COOLING TOWER COMPANY
STOCKTON, CALIFORNIA

FIGURE 3



Attachment C

SOURCE: DUDEK & ASSOCIATES, INC.

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PHASE II TREATMENT AREA

MARLEY COOLING TOWER COMPANY
STOCKTON, CALIFORNIA

FIGURE 4

MRP No. R5-2003-0800
SPX Corporation, Marley Cooling Tower Company
In Situ Groundwater Remediation Pilot Study
San Joaquin County

TABLE 2 (continued)
Phase 2 Pilot Study - Calcium Polysulfide and Ethanol Injection
Monitoring Locations, Sampling Parameters, and Frequency of Monitoring

	Sampling Parameters and Monitoring Frequency					
Injection Zone 3 Test Area	**Monitoring Location**	**Prior to Injection**	**2 Days Following Injection in Phase 2 Test Area**	**5 Days Following Injection in Phase 2 Test Area**	**10, 20*, 40 Days Following Injection in Phase 2 Test Area**	**Quarterly Following Injection in Phase 2 Test Area**
	MW-101	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br, GP	Field Parameters, Total Cr, Cr VI As, Br, Cu, Fe, Mn, NO3, SO4	Field Parameters, Total Cr, Cr VI, TDS, Br	Field Parameters, Total Cr, Cr VI, As, SO4, Br, TDS*	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	S-2 (MW-104)	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br, GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	MW-103	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br, GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	MW-208	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br, GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	S-8 (MW-204)	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br, GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	S-7 (MW-205)	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br, GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP

Injection Zone 4 Test Area	**Monitoring Location**	**Prior to Injection**	**2 Days Following Injection in Phase 2 Test Area**	**5 Days Following Injection in Phase 2 Test Area**	**10, 20*, 40 Days Following Injection in Phase 2 Test Area**	**Quarterly Following Injection in Phase 2 Test Area**
	TW-7	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr, Cr VI As, Br, Cu, Fe, Mn, NO3, SO4	Field Parameters, Total Cr, Cr VI, TDS, Br	Field Parameters, Total Cr, Cr VI, As, SO4, Br, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	MW-105	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	MW-101	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	S-2 (MW-104)	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	MW-103	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	S-8 (MW-204)	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP
	S-7 (MW-205)	Field Parameters, Total Cr, Cr VI As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP	Field Parameters, Total Cr		Field Parameters, Total Cr, Cr VI, TDS*	Field Parameters, Total Cr, Cr VI, As, Cu, Fe, Mn, NO3, SO4, TDS, Br,GP

* Analyze TDS only for samples collected prior to injection and 20 days following injection in Phase 2 Test Area

Field Parameters = ORP, pH, DO, EC, Temperature
ORP = Oxidation reduction potential
DO = Dissolved oxygen
EC = Electrical Conductivity
Cr = Chromium (total)
Cr VI = Hexavalent chromium
As = Arsenic
GP = General Parameters
GP = Chloride, Phosphate (total), Calcium, Sodium, Potassium, Hardness, and Alkalinity

Br = Bromide
Cu = Copper
Fe = Iron
Mn = Manganese
NO3 = Nitrate
SO4 = Sulfate
TDS = Total Dissolved Solids